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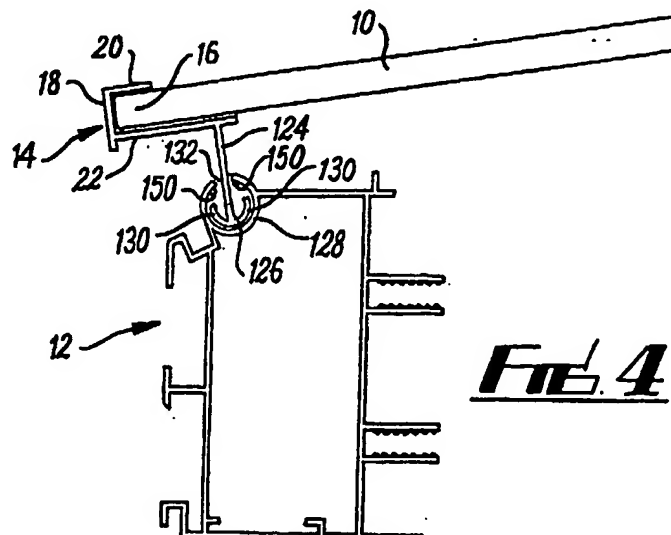
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(54) Abstract Title

**Panel end fitting**

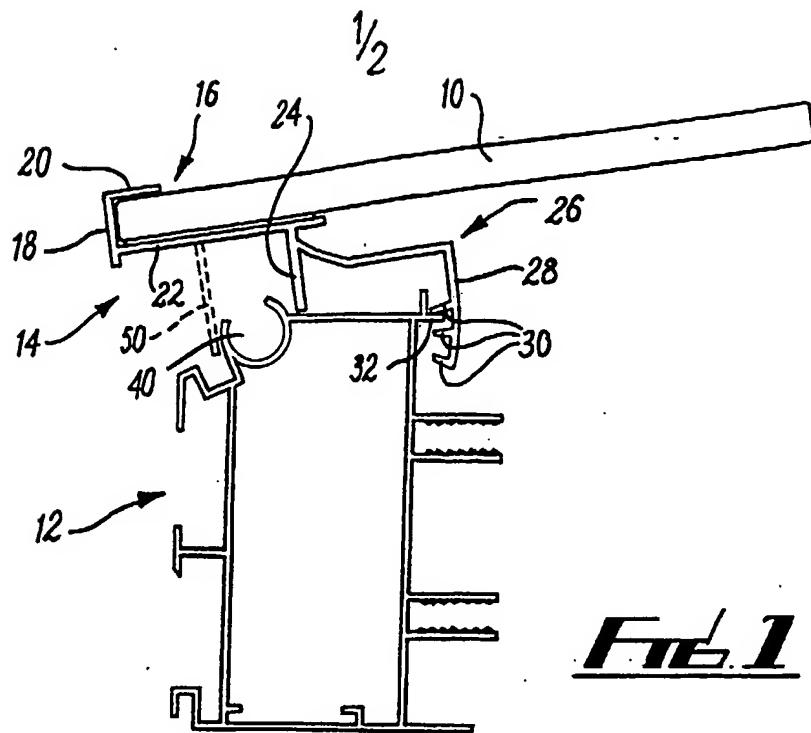
(57) A roofing structure comprises an eaves structure 12, glazing bars supported on the eaves structure 12, one or more roofing panels 10 supported by the glazing bars and an end fitting 14 coupled to the eaves structure 12. A portion 20 of the end fitting 14 overlies an end of the or each roofing panel 10. The coupling between the end fitting 14 and the eaves structure 12 is through male 124 and female 128 connector parts which are coupled together by push insertion such that the male part 124 is captive against withdrawal from the female part 128. The male part 124 may be rendered captive by formations 150 in the entry opening 132 of the female part 128. The connection may be such that the end fitting 14 can tilt about an axis generally parallel to the longitudinal axis of the eaves structure 12.

Also disclosed is an arrangement in which the coupling between the end fitting and eaves structure comprises a fulcrum arrangement at a first location and a connection internally of the outer face of the eaves structure.

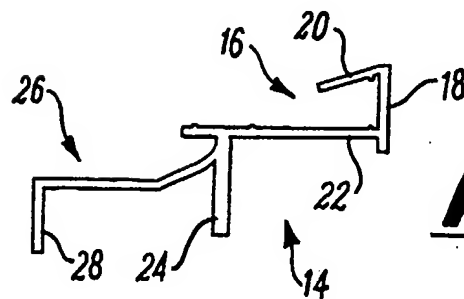


**FIG. 4**

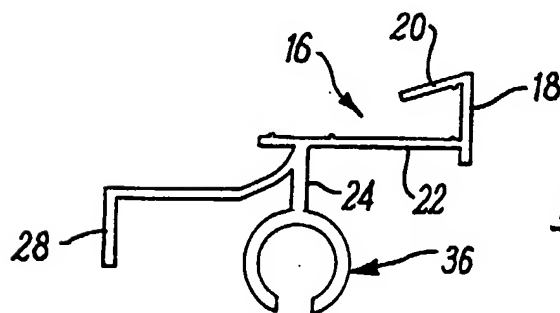
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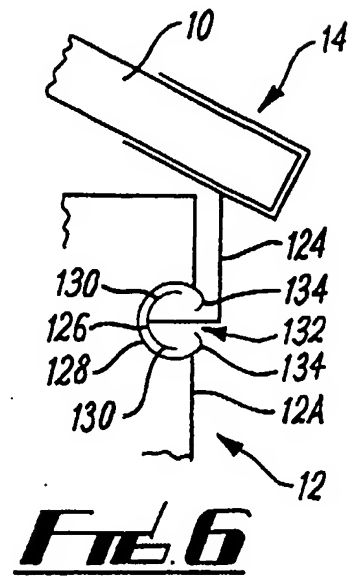
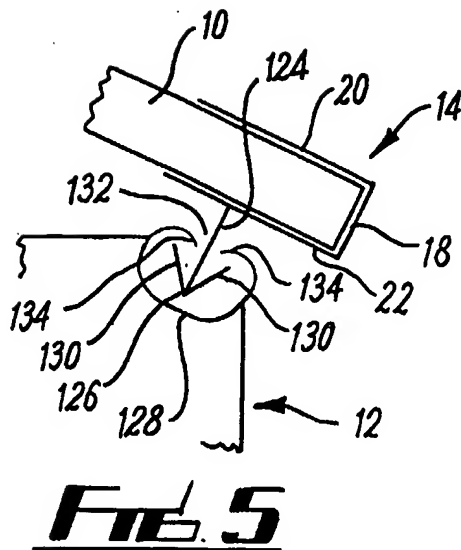
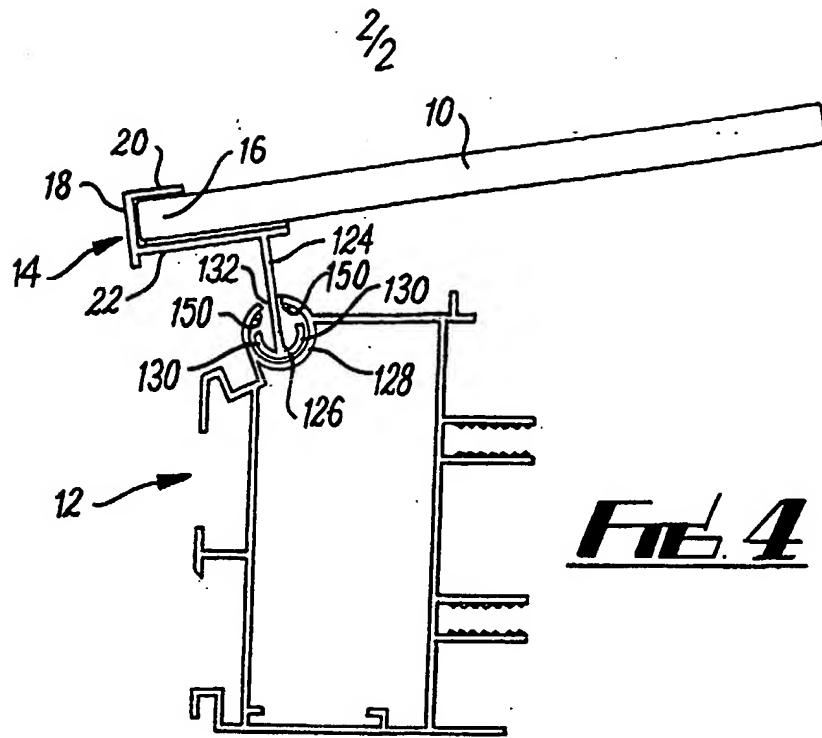
***Fig. 1***



***Fig. 2***



***Fig. 3***



**PANEL END FITTING**

This invention relates to roof structures.

5

The invention has particular application to roof structures for glazed conservatories in which roofing panels, of polycarbonate, polyvinyl chloride or glass for example, are supported by glazing bars which in turn are supported by an eaves structure.

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In a known form of glazing bar assembly, as disclosed in British Patent Application No. 2347963, the assembly comprises an elongated bar which serves to support the panels and an elongated capping element which has a plastics connector which engages as a push fit in a channel in the bar. This design offers virtually no security against break-in by a would-be intruder through the roof of a conservatory or other premises since the capping element can readily be levered away from the bar thereby allowing one of more roofing panels to be lifted to gain access.

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The present invention seeks to provide an improved security for roofing structures.

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According to one aspect of the present invention there is provided a roofing structure comprising an eaves structure, glazing bars supported on the eaves structure, one or more roofing panels supported by the glazing bars and an end fitting including a portion overlying one end of the roofing panel, the end fitting being connected to the eaves structure through male and female connector parts which are arranged to be coupled together by push insertion of the male part into the female part in a direction transverse to the eaves structure in such a way that the male part is captive against withdrawal in the opposite direction to insertion.

25

For the avoidance of doubt, the phrase "captive against withdrawal" is not to be interpreted in a strict literal sense irrespective of the force exerted in attempting to withdraw the male part; rather it is to be interpreted as meaning that withdrawal is not possible without damaging one or other part or both, e.g. to the extent that it is no longer possible to reassemble them together with the male part held captive within the female part.

Once the male part is captive, lifting of the panel(s) is prevented at that end of the roofing structure. Usually the other end of the roofing panel or panels extend to a ridge structure part of which overlies that end of the roofing panel(s) and it will be seen that the end fitting associated with the eaves structure will, in this event, afford security against break-in even if the glazing bars are designed as disclosed in British Patent Application No. 2347963 because both ends of the panel remain trapped at the ridge and eaves structures thereby obstructing any attempt to remove the panel(s).

The male part may be rendered captive by a formation or formations located in vicinity of the entry opening to the female part.

The blocking formation(s) may be provided on the female part.

The blocking formation(s) may be provided in the vicinity of the entry opening of the female part.

The end fitting may include a channel-defining portion at its forward end for reception of the forward end of the panel(s).

The male and female parts may interfit in such a way as to permit the end fitting to tilt at least about an axis generally parallel to the longitudinal axis of the eaves structure.

5           In one embodiment of the invention, the male part includes a pair of oppositely directed wing portions which can deflect towards one another to allow insertion through an entry opening of the female part but which restore once inserted and block withdrawal of the male part. The blocking action may be implemented by co-operation between the wing portions, e.g. the free ends thereof, and one or more formations  
10       provided in the vicinity of the margins of the entry opening, e.g. in such a way as to prevent deflection of the wing portions towards each other. Such formations may be constituted by configuring the margins appropriately, e.g. by configuring them so that they are in-turned. Additionally or alternatively, the or each formation may be in the form of a lip, nib or the like provided on the end fitting at a suitable location in relation to the entry  
15       opening.

The male part may be provided on the end fitting while the female part may be provided on the eaves structure, or vice versa.

20           The male and female parts may be of generally part-circular configuration and the arrangement may be such that the male part forms a knuckle fitting within the female part which may be a socket associated with the eaves structure.

          According to a second aspect of the present invention there is provided a  
25       roofing structure comprising an eaves structure, glazing bars supported on the eaves structure, one or more roofing panels supported by the glazing bars and an end fitting including a portion overlying one end of the roofing panel, the end fitting and eaves structure being coupled at one location by a fulcrum arrangement so that the end fitting can

be mounted in different tilted attitudes with respect to the eaves structure and the end fitting being adapted to be coupled to the eaves structure internally of the outer face of the latter and at a location spaced from the fulcrum arrangement.

5                   In this way, lifting of the panel(s) is prevented at that end of the roofing structure.

                  In this aspect of the invention, the end fitting may include a channel-defining portion at its forward end for reception of the forward end of the panel(s) and a section  
10               which extends rearwardly between the panel(s) and the eaves structure and is adapted to be engaged with the eaves structure on the inboard side of the latter.

                  In a typical embodiment of the invention, the end fitting may comprise a channel for reception of the forward end of a roofing panel, a laterally projecting leg which  
15               serves as a fulcrum to allow tilting or rocking of the end fitting so as to accommodate the pitch of the roof and an L-shaped section extending rearwardly of the leg to provide a limb which extends laterally in the same general direction as the leg whereby the limb may be engaged with the eaves structure at a location on the inboard side of the eaves structure.

20               The end fitting may be provided with one or more projections for co-operation with the eaves structure to allow the extent of the tilting angle to be set.

                  The end fitting and the eaves structure may be provided with formations which can be interfitted to allow tilting or rocking of the end fitting.  
25

                  The interfitting formations may be of part-circular configuration and the arrangement may be such that the formation associated with the end fitting forms a knuckle fitting within a socket associated with the eaves structure.

The end fittings of the invention may be of a plastics material or they may be of a metal or metal alloy particularly one which may be extruded, e.g. aluminium.

Usually the other end of the roofing panel or panels extend to a ridge structure  
5 part of which overlies that end of the roofing panel(s) and it will be seen that the end fittings in accordance with the above aspects of present invention will afford security against break-in even if the glazing bars are designed as disclosed in British Patent Application No. 2347963 because both ends of the panel remain trapped at the ridge and eaves structures thereby obstructing any attempt to remove the panel(s).

10

The invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a sectional view through the eaves structure of a pitched  
15 conservatory roof, illustrating one form of end fitting;

Figure 2 is a cross-sectional view illustrating a second form of end fitting;

Figure 3 is a cross-sectional view illustrating a third form of end fitting.

Figure 4 is a similar view to that of Figure 1, illustrating another form of end fitting;

20 Figure 5 is a sectional view illustrating a further form of end fitting; and

Figure 6 is a sectional view illustrating yet another form of end fitting.

Referring to Figure 1, a pitched conservatory roof comprises a number of spaced glazing bars (not shown) between which polycarbonate or like roofing panels 10  
25 are supported along their edges. The glazing bars extend between a ridge structure (not shown) and a box section eaves structure 12 which may be manufactured as an aluminium or aluminium alloy extrusion. The panels are supported with their ends overhanging the

eaves structure 12 to drain into guttering (not shown). The eaves structure 12 surmounts a side of the conservatory.

Associated with the lower or forward ends of the panels 10 is an end fitting 14 which may be manufactured as a plastics extrusion or a metal extrusion such as an aluminium or aluminium alloy extrusion. The end fitting 14 has at its forward end a channel 16 having a rearwardly directed open mouth for reception of the forward ends of the panels 10. The channel 16 is defined by a base 18 which closes the open end of the polycarbonate panel, a wall 20 which overlies the marginal edges at the lower ends of the panels 10 and a lower wall 22 which underlies the lower end of the panel. In this manner, the end fitting co-operates with the lower panel edges extending between adjacent glazing bars. The wall 22 may serve as a thermal break in that it prevents direct exposure of the overhanging portions of the inner faces of the panels.

The fitting includes a downwardly directed leg 24 which projects laterally from the wall 22, e.g. at an angle of 90 degrees, for engagement with the top wall of the eaves structure 12 so as to act as a fulcrum about which the fitting can tilt or rock about an axis parallel to the axis of elongation of the end fitting (i.e. perpendicular to the plane of the paper as viewed in Figure 1) to accommodate the pitch of the roof. The leg 24 also serves as a closure for the gap between the underside of the panel 10 and the top of the eaves structure 12.

An L-section shaped portion 26 extends rearwardly of the leg 24 and includes a laterally projecting limb 28 which is spaced from and extends downwardly in generally parallel relation with the leg 24 for co-operation with the rear of the eaves structure. The limb 28 is intended to be fastened to the eaves structure so as to locate the end fitting 14. To this end, the limb 28 and the rear of the eaves structure may be drilled to receive a self-tapping screw to firmly secure the end fitting in place. It will be noted that the attachment

of the end fitting 14 to the eaves structure 12 is located interiorly and cannot be accessed from the exterior when the roof panels are in place.

To facilitate tilting of the end fitting according to requirements, the limb 28  
5 may be provided with a number of forwardly directed projections 30 for co-operation with a flange 32 projecting rearwardly from the eaves structure. As shown in Figure 1, the flange 32 is located between the uppermost and intermediate projections 30 but it will be understood that the angle of tilt of the end fitting can be increased by arranging it so that the flange 32 is located between the intermediate and lower projections 30. In the  
10 illustrated embodiment, three such projections are provided; by using a larger number of projections and/or a different spacing between adjacent projections, the incremental change in the tilting angle may be modified as desired.

Figure 2 illustrates a modification in which like parts are depicted by the same  
15 reference numerals. In this embodiment, the limb 28 is not provided with projections 30 as in Figure 1. In this case, the limb 28 is simply connected, e.g. by means of a screwthreaded fastener, to the eaves structure after it has been tilted to the appropriate angle about the leg 24. In Figure 2, it will be noted that the upper wall 20 is downwardly inclined so that insertion of the panel into the channel 16 involves some flexure of the wall  
20 20 which may then bear against the panel. This feature may also be present in the embodiment of Figure 1 if desired.

Figure 3 illustrates another modification using the same reference numerals  
as in Figure 1 to identify like parts. In this embodiment, the leg 24 terminates in a knuckle-  
25 shaped formation 36 which is adapted for reception in a channel 40 of the eaves structure (see Figure 1) in such a way that the formation 36 can pivot or rotate in the channel 40 to afford the tilting action necessary to accommodate the pitch of the roof. As illustrated, the knuckle 36 and the channel 40 are of part-circular section for this purpose. To facilitate

insertion of the knuckle 36 into the channel, it may be hollow and interrupted, as shown at 42, so that it can be deformed sufficiently for insertion as a push fit into the channel 40 and then spring back to its original shape especially where the end fitting is of a plastics material. In other instances, the knuckle 36 may be introduced from one end of the channel  
5 40 and slid to the desired location. As described below with reference to the embodiments of Figures 4 to 6, where the knuckle 36 is push-inserted into the channel 40, a formation or formations may be provided in the vicinity of the entry opening of the channel so as to block withdrawal of the knuckle.

10 Referring now to Figure 4, in this embodiment the end fitting includes a downwardly directed leg 124 which is formed with a spigot 126 which is generally wing-shaped or of arrow head configuration for engagement in a socket 128 located adjacent the forward corner at the top of the eaves structure 12, the arrangement being such that the fitting can tilt or rock about an axis parallel to the axis of elongation of the eaves structure  
15 (i.e. perpendicular to the plane of the paper as viewed in Figure 4) to accommodate the pitch of the roof. The leg 124 may also serve as a closure for the gap between the underside of the panel 10 and the top of the eaves structure 12.

The spigot 126 comprises a pair of wing portions 130 projecting to either side  
20 of the leg 124. Assembly of the spigot 126 to the socket 128 involves push insertion of the spigot 126 through a slot-shaped opening 132 forming the mouth of the socket 128. To this end, the wing portions 130 have some degree of flexibility such that they close up during insertion through the opening 132 and then spring back or restore to the configuration illustrated once fully inserted into the socket. Although the spigot may be readily inserted  
25 into the socket, once the parts have been assembled the spigot is then captive against withdrawal through the opening by virtue of expansion of the wing portions 130 to the illustrated configuration. To ensure that withdrawal is blocked, the marginal edges of the opening 132 may be turned inwardly or provided with inwardly projecting lips or other

formations which co-operate with the free ends of the wing portions 130 to trap the spigot. In Figure 4, these formations are illustrated as nibs 150 which, in the event of any attempt to pull out the spigot 126, co-operate with the free edges of the wing portions 130 to block withdrawal.

5

In the modification of Figure 5, the wing portions are configured so that the spigot 126 is of arrowhead configuration and the marginal edges of the opening 132 are inwardly turned at 134 to co-operate with the wing portions 130 and thereby block withdrawal of the spigot once it has been push inserted into the socket.

10

In the embodiment of Figure 6, the spigot and socket are generally of the same configuration as shown in Figure 4 but the socket in this case is located partway down the front wall 12A of the eaves structure.

15

Although the arrangement can be such that the spigot cannot be withdrawn from the socket in a direction tranverse to the longitudinal axis of the eaves structure (at least not without damage to the spigot and/or the socket), it will be appreciated that because the eaves structure is usually an extruded component with the socket extending along the full extent of its length, the end fitting may be uncoupled from the eaves structure by sliding it along the eaves structure to the end of the latter.

20

In each embodiment, the wall 22 may be provided with spacing elements such as ribs to space the underside of the roof panel from the wall 22 to permit water drainage in the event of water ingress into the channel 16. If desired, the channel, e.g. the wall 22, may be provided with outlet holes to allow drainage of any water into the guttering.

25

The end fittings in each case will typically be cut to length (from an extruded profile) to correspond with the spacing between adjacent glazing bars, although the

possibility of using an end fitting of a length sufficient to span the width of two or more roofing panels is not excluded nor is the possibility of using end fittings which are somewhat narrower than the spacing between adjacent glazing bars.

5           The ridge structure includes a part which overlies the upper ends of the panels with the consequence that lifting of the upper ends is prevented. If the glazing bars are designed as disclosed in British Patent Application No. 2347963, after the capping elements have been levered from the bars to expose the edges of the roofing panels, it is then a simple matter to slide the panel downwardly clear of the ridge structure so that it can  
10 be removed thereby giving an intruder access to the interior of the conservatory. The use of an end fitting according to the present invention, e.g. as illustrated in the embodiments of Figures 1 to 3, serves to trap the lower end of each panel thereby preventing the lower end of the panel being lifted and a would-be intruder is further hindered by the fact that the fixture of the end fitting is located interiorly and is not therefore accessible without  
15 damaging the roofing panel thereby creating noise which could alert others to the intruder's activity.

          In a modification of the illustrated embodiments, the end fitting may be provided with a downwardly depending leg located forwardly of the fulcrum and forming  
20 a closure or weatherproofing member which covers the gap between the underside of the roofing panels and the forward face of the eaves beam. This is depicted in phantom outline by reference numeral 50 in the embodiment of Figure 1 but it will be appreciated that it may also be incorporated in other embodiments of the invention. The weatherproofing member 50 may be of a flexible nature so that, regardless of the angle of tilt of the end  
25 fitting, it makes sealing contact with a front surface of the eaves beam.

Where the end fitting is fabricated as a metal extrusion, it may incorporate a thermal break between the fulcrum and the remainder of the end fitting, e.g. between the leg 24 or 124 and the lower wall 22.

- 5           The end fittings of the present invention may be used in conjunction with the inventions disclosed in any one or more of co-pending British Patent Applications Nos. 0119048.7, 0119047.9, 0118713.7 and 0118716.0, the entire disclosures of which are incorporated herein by this reference.

## CLAIMS

1. A roofing structure comprising an eaves structure, glazing bars supported on the eaves structure, one or more roofing panels supported by the glazing bars and an end fitting including a portion overlying one end of the roofing panel, the end fitting being connected to the eaves structure through male and female connector parts which are arranged to be coupled together by push insertion of the male part into the female part in a direction transverse to the eaves structure in such a way that the male part is captive against withdrawal in the opposite direction to insertion.
2. A structure as claimed in Claim 1 in which the male part is rendered captive by a formation or formations located in vicinity of the entry opening to the female part.
3. A structure as claimed in Claim 2, the blocking formation(s) being provided on the female part.
4. A structure as claimed in Claim 2 or 3, the blocking formation(s) being provided in the vicinity of the entry opening of the female part.
5. A structure as claimed in any one of the preceding claims in which the male part includes a pair of oppositely directed wing portions which can deflect towards one another to allow insertion through an entry opening of the female part but which restore once inserted and block withdrawal of the male part.
6. A structure as claimed in Claim 5 in which the blocking action is implemented by co-operation between the wing portions and the margins of the entry opening in such a way as to prevent deflection of the wing portions towards each other.

7. A structure as claimed in Claim 6 in which the margins are provided with lips, nibs or other blocking formations within the interior of the female part.

8. A structure as claimed in any one of the preceding claims in which the end fitting includes a channel-defining portion at its forward end for reception of the forward end of the panel(s).

9. A structure as claimed in any one of the preceding claims in which the male and female parts interfit in such a way as to permit the end fitting to tilt at least about an axis generally parallel to the longitudinal axis of the eaves structure.

10. A structure as claimed in any one of the preceding claims in which the male part is provided on the end fitting while the female part is provided on the eaves structure.

11. A structure as claimed in any one of the preceding claims in which the end fitting is of a plastics material, metal or metal alloy.

12. A structure as claimed in any one of the preceding claims in which the male and female parts are of generally part-circular configuration.

13. A structure as claimed in any one of the preceding claims in which the arrangement is such that the male part forms a knuckle fitting within the female part.

14. A structure as claimed in any one of Claims 1 to 13 in which the male part has an arrowhead configuration.

15. A structure as claimed in any one of the preceding claims in which the part associated with the eaves structure is located on the top wall thereof or at the junction between the top and the front wall of the eaves structure.

5 16. A structure as claimed in any one of Claims 1 to 14 in which the part associated with the eaves structure is located on the front wall thereof.

17. A roofing structure comprising an eaves structure, glazing bars supported on the eaves structure, one or more roofing panels supported by the glazing bars and an end fitting including a portion overlying one end of the roofing panel, the end fitting and eaves structure being coupled at one location by a fulcrum arrangement so that the end fitting can be mounted in different tilted attitudes with respect to the eaves structure and the end fitting being adapted to be coupled to the eaves structure internally of the outer face of the latter and at a location spaced from the fulcrum arrangement.

15 18. An end fitting for a roofing structure, the end fitting comprising a channel for location at the eaves structure of the roofing structure and arranged to receive the forward end of a roofing panel, a laterally projecting leg which serves as a fulcrum to allow tilting or rocking of the end fitting relative to the eaves structure so as to accommodate the pitch of the roof, and a section extending rearwardly of the leg to provide a limb which extends laterally in the same general direction as the leg whereby the end fitting may be engaged with the eaves structure at a location on the inboard side of the eaves structure.

20 19. A structure or fitting as claimed in Claim 17 or 18, the fitting comprising an extrusion.

25 20. A structure or fitting as claimed in Claim 19, the fitting being made of a plastics material or a metal or metal alloy.

21. A structure or fitting as claimed in any one of Claims 17 to 20, the fitting being provided with one or more projections for co-operation with the eaves structure to allow the extent of the tilting angle to be set.

5

22. A structure or fitting as claimed in any one of Claims 17 to 21, the fitting being provided with a formation for interfitting with a generally complementary formation associated with the eaves structure.

10 23. A structure or fitting as claimed in Claim 22 in which the interfitting formations are of part-circular configuration and the arrangement is such that the formation associated with the fitting forms a knuckle fitting within a socket associated with the eaves structure.

15 24. A structure or fitting as claimed in Claim 22 or 23 in which the formation associated with the fitting is resiliently deformable to allow it to be deformed for insertion into the formation associated with the eaves structure.

20 25. A structure or fitting as claimed in any one of the preceding claims including a weatherproofing member for co-operation with the eaves beam.

26. A fitting substantially as hereinbefore described with reference to, and as shown in, any one of the embodiments illustrated in Figures 1 to 6 of the accompanying drawings.



INVESTOR IN PEOPLE

Application No: GB 0216970.4  
Claims searched: 1-16

Examiner: Eleanor Wade  
Date of search: 1 November 2002

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK Cl (Ed.T): E1R: RF, RRD, RRF, RRH, RRK, RRV, RRX  
Int Cl (Ed.7): E04B, E04D, E06B  
Other: Online: EPODOC, WPI, JAPIO

### Documents considered to be relevant:

Category	Identity of document and relevant passage			Relevant to claims
Y	GB 2357783	Xtralite Ind Rooflights Ltd	see esp figs 5 & 6	1-5,7-10, 15,16,25
Y	US 4251964	Francis	see esp fig 3	1-5,7-10, 15,16,25

X Document indicating lack of novelty or inventive step  
Y Document indicating lack of inventive step if combined with one or more other documents of same category.  
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E Patent document published on or after, but with priority date earlier than, the filing date of this application.